IB10045

CRS Issue Brief for Congress

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Broadband Internet Access: Background and Issues

Updated May 2, 2001

Lennard G. Kruger and Angele A. Gilroy
Resources, Science, and Industry Division

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Broadband Internet Access: Background and Issues

SUMMARY

Broadband or high-speed Internet access is provided by a series of technologies that give users the ability to send and receive data at volumes and speeds far greater than current Internet access over traditional telephone lines. In addition to offering speed, broadband access provides a continuous, "always on" connection (no need to dial-up) and a "two-way" capability, that is, the ability to both receive (download) and transmit (upload) data at high speeds. Broadband access, along with the content and services it might enable, has the potential to transform the Internet: both what it offers and how it is used. It is likely that many of the future applications that will best exploit the technological capabilities of broadband have yet to be developed.

There are multiple transmission media or technologies that can be used to provide broadband access. These include cable, an enhanced telephone service called digital subscriber line (DSL), satellite, fixed wireless, and others. While many (though not all) offices and businesses now have Internet broadband access, a remaining challenge is providing broadband over "the last mile" to consumers in their homes. Currently, a number of competing telecommunications companies are developing, deploying, and marketing specific technologies and services that provide residential broadband access.

From a public policy perspective, the goals are to ensure that broadband deployment is timely, that industry competes fairly, and that service is provided to all sectors and geographical locations of American society. The federal government — through Congress and the Federal Communications Commission (FCC) — is seeking to ensure fair competition among the players so that broadband will be available and affordable in a timely manner to all Americans who want it. While the FCC's position is not to intervene at this time, some assert that legislation is necessary to ensure fair competition and timely broadband deployment.

One proposal would ease certain legal restrictions and requirements, imposed by the Telecommunications Act of 1996, on incumbent telephone companies who provide high speed data (broadband) access. Proponents assert that restrictions must be lifted to give incumbent local exchange companies (ILECs) the incentive to build out their broadband networks. Opponents argue that lifting restrictions would allow the ILECs to monopolize voice and data markets.

Another proposal would compel cable companies to provide "open access" to competing Internet service providers. Supporters argue that open access is necessary to prevent cable companies from creating "closed networks" and stifling competition. Opponents of open access counter that healthy competition does and will exist in the form of alternate broadband technologies such as DSL and satellite.

Finally, legislation seeks to accelerate broadband deployment in rural and low income areas by providing loans, grants, or tax credits to entities deploying broadband technologies.

While no broadband legislation was enacted in the 106th Congress, similar legislation has been introduced into the 107th Congress.

MOST RECENT DEVELOPMENTS

H.R. 1542 (Tauzin-Dingell) was introduced on April 24, 2001. The legislation seeks to ease certain legal restrictions and requirements on Bell operating companies and other incumbent local exchange companies (ILECs) providing broadband service. On April 25, the House Energy and Commerce Committee held a hearing on H.R. 1542; the Subcommittee on Telecommunications and the Internet held a markup on April 26. Meanwhile, broadband tax credit bills (S. 88, S. 150, S. 426, and H.R. 267) and grant/loan guarantee bills (S. 428 and H.R. 1416) have also been introduced into the 107th Congress.

BACKGROUND AND ANALYSIS

Broadband or high-speed Internet access is provided by a series of technologies that give users the ability to send and receive data at volumes and speeds far greater than current Internet access over traditional telephone lines. Currently, a number of telecommunications companies are developing, installing, and marketing specific technologies and services to provide broadband access to the home. Meanwhile, the federal government — through Congress and the Federal Communications Commission (FCC) — is seeking to ensure fair competition among the players so that broadband will be available and affordable in a timely manner to all Americans who want it.

What is Broadband and Why is it Important?

The Internet has grown exponentially during the 1990s. According to the Department of Commerce, over 40% of American households now have access to the Internet, while about 45% of all Americans have Internet access at home and/or outside the home.[1] Today, the majority of residential Internet users access the Internet through the same telephone line that can be used for traditional voice communication. A personal computer equipped with a modem is used to hook into an Internet dial-up connection provided (for a fee) by an Internet service provider (ISP) of choice. The modem converts analog signals (voice) into digital signals that enable the transmission of "bits" of data.

The faster the data transmission rate, the faster one can download files or hop from Web page to Web page. The highest speed modem used with a traditional telephone line, known as a 56K modem, offers a maximum data transmission rate of about 45,000 bits per second (bps). However, as the content on the World Wide Web becomes more sophisticated, the limitations of relatively low data transmission rates (called "narrowband") such as 56K become apparent. For example, using a 56K modem connection to download a 10-minute video or a large software file can be a lengthy and frustrating exercise. By using a broadband high-speed Internet connection, with data transmission rates many times faster than a 56K modem, users can view video or download software and other data-rich files in a matter of seconds. In addition to offering speed, broadband access provides a continuous "always on" connection (no need to "dial-up") and a "two-way" capability — that is, the ability to both receive (download) and transmit (upload) data at high speeds.

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[1] U.S. Department of Commerce, *Falling Through the Net: Toward Digital Inclusion*, October 2000, p. XV. Available at: [http://www.esa.doc.gov/fttn00.pdf]

Broadband access, along with the content and services it might enable, has the potential to transform the Internet — both what it offers and how it is used. For example, a two-way high speed connection could be used for interactive applications such as online classrooms, showrooms, or health clinics, where teacher and student (or customer and salesperson, doctor and patient) can see and hear each other through their computers. An "always on" connection could be used to monitor home security, home automation, or even patient health remotely through the Web. The high speed and high volume that broadband offers could also be used for bundled service where, for example, cable television, video on demand, voice, data, and other services are all offered over a single line. In truth, it is possible that many of the applications that will best exploit the technological capabilities of broadband, while also capturing the imagination of consumers, have yet to be developed.

Many (though not all) offices and businesses now have Internet broadband access. A major challenge remaining (as well as an enormous business opportunity) is providing broadband over "the last mile" to consumers in their homes. Currently, between 4 and 5% of U.S. households in the United States have broadband access. The vast majority of residential Internet users today use "narrowband" access, that is, they connect via a modem through their telephone wire. However, the changeover to residential broadband has begun, as companies have started to offer different types of broadband service in selected locations. Indeed, throughout the telecommunications and information industry, companies have been investing, acquiring, and merging to position themselves for what is felt to be a coming explosion in broadband Internet use. No one knows exactly how many consumers will be willing to pay for broadband service. Currently, the cost of residential broadband service ranges from about $40 and upward per month, plus up to several hundred dollars for installation and equipment.

Broadband Technologies

There are multiple transmission media or technologies that can be used to provide broadband access. These include cable, an enhanced telephone service called digital subscriber line (DSL), satellite technology, terrestrial (or fixed) wireless technologies, and others. Cable and DSL are currently the most widely used technologies for providing broadband access. Both require the modification of an existing physical infrastructure that is already connected to the home (i.e., cable television and telephone lines). Each technology has its respective advantages and disadvantages, and will likely compete with each other based on performance, price, quality of service, geography, user friendliness, and other factors. The following sections summarize cable, DSL, and other prospective broadband technologies.

Cable. The same cable network that currently provides television service to consumers is being modified to provide broadband access with maximum download speeds ranging from 3-10 million bits per second (Mbps), and upload speeds from 128 thousand bits per second (Kbps) to 10 Mbps. In practice, transmission speeds range from several thousand Kbps to 1.5 Mbps. Because cable networks are shared by users, access speeds can decrease during peak usage hours, when bandwidth is being shared by many customers at the same time. Network sharing has also led to security concerns and fears that hackers might be able to eavesdrop on a neighbor's Internet connection.

Both television signals and data are carried by a combination of fiber optic and coaxial cable, known as hybrid fiber coax (HFC). Because cable television is strictly one-way (from the cable company into the home), a number of technical modifications must be made to the cable network to provide two-way high-speed Internet connectivity. One-way signal amplifiers throughout the cable system must be replaced by two-way units, which can handle data traffic going in both directions. Special boxes are installed at the subscribers' premises to separate upstream (to the cable company) from downstream (to the home) traffic, and a cable modem is installed into the customer's computer. Groups of houses are connected to shared networks, which terminate in a cable modem termination system (CMTS). The CMTS connects to the regional and national Internet backbones, which tie into the rest of the Internet. The cost of migrating a cable system to broadband is somewhere between $200 and $600 per household passed (i.e., homes passed by the cable regardless of whether the household is actually a customer.)[2]

Digital Subscriber Line (DSL). DSL is a modem technology that converts existing copper telephone lines into two-way high speed data conduits. While there are a number of types of DSL technologies, the most used currently is ADSL, or Asymmetric Digital Subscriber Line.[3] Data transmission speeds via ADSL range up to 7 Mbps for downloading and 1 Mbps for uploading. Speeds can depend on the condition of the telephone wire and the distance between the home and the telephone company's central office (i.e., the building that houses telephone switching equipment).

An ADSL circuit consists of an ADSL modem at each end of the telephone line — one at the customer's computer and the other at the phone company's central DSL network. Using digital coding techniques to squeeze more than 100 times greater capacity out of a phone line, the two modems create three information channels running through the copper telephone wire: a high speed downstream channel, a medium speed duplex channel that can be used for upstream transmission, and a channel for voice or fax communication. Because ADSL uses frequencies much higher than those used for voice communication, both voice and data can be sent over the same telephone line. Thus, customers can talk on their telephone while they are online, and voice service will continue even if the ADSL service goes down.

Like cable broadband technology, an ADSL line is "always on" with no dial-up required. Unlike cable, however, ADSL has the advantage of being unshared between the customer and the central office. Thus, data transmission speeds will not necessarily decrease during periods of heavy local Internet use. A disadvantage relative to cable is that ADSL deployment is constrained by the distance between the home and the central office. ADSL is only available, at present, to homes within 18,000 feet (about three miles) of a central office facility. However, DSL providers are currently exploring ways to further increase deployment range.

Satellite. Internet access via satellite is available to businesses from a number of firms, and satellite delivered television is received by 11.8 million subscribers. Until recently, however (see below), only one satellite technology — Hughes Network System's DirecPC

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[2] Dutta-Roy, Amitava, "Cable: It's Not Just for TV," IEEE Spectrum, May 1999, p. 5.

[3] "Asymmetric" because transmission speed is higher in one direction (from the Internet to the home) than in the other direction (from the home to the Internet).

— has been available to residential customers for data transmission (i.e., Internet access). With an 18-inch satellite dish, installed at the subscriber's home and aimed at a geostationary satellite located above the equator, downloading speeds of up to 400 Kbps can be achieved. As of December 2000, uploading via satellite has not been possible; to transmit data, subscribers use a 56K modem to dial-up an Internet connection over their telephone line.

Unlike cable or DSL technology, DirectPC has not been "two-way" or "always on," because users must dial up an Internet connection to hook into the system. Both cable and DSL offer faster and cheaper broadband access than the satellite Internet access currently offered residential customers. Also, like cable (and unlike DSL), satellite is a shared medium, meaning that privacy may be compromised and performance speeds may vary depending upon the volume of simultaneous use. Another disadvantage of Internet -over-satellite is its susceptibility to disruption in bad weather. On the other hand, the big advantage of satellite is its universal availability. Whereas cable or DSL is not available to many Americans, satellite connections can be accessed by anyone with a satellite dish. This makes satellite Internet access a possible solution for rural or remote areas not served by other technologies.

Currently, DirecPC has about 40,000 users in the U.S. Jupiter Communications predicts about one million users by 2003. The satellite industry is working to develop upgraded systems that will allow two-way and higher speed satellite Internet connections. On November 6, 2000, Starband Communications announced the first two-way Internet access satellite service for the home, offering 500 Kbps downstream and 150 Kbps upstream. On December 21, 2000, Hughes announced the first shipments of its new two-way broadband satellite service, with advertised download rates of 400 Kbps and upload rates of up to 256 Kbps. Over the next several years, other satellite companies such as Teledesic, Wildblue (formerly iSky), SkyBridge, and others are planning to offer two-way Internet access at transmission speeds of millions of bits per second.

Other Technologies. Other technologies are being used or considered for residential broadband access. Terrestrial or fixed wireless systems transmit data over the airwaves from towers or antennas. Though mostly used for businesses, fixed wireless Internet is beginning to be deployed for residential broadband service. Advantages are the flexibility and lower cost of deployment to the customer's home (as opposed to laying or upgrading cable or telephone lines). Disadvantages are line-of-sight restrictions (in some cases), the susceptibility of some technologies to adverse weather conditions, and the scarcity of available spectrum. In FY2000, the FCC began auctioning frequencies currently occupied by broadcast channels 60-69.[4] The next major auction of this spectrum (700 MHZ band) is scheduled to begin September 12, 2001. These frequencies are considered "prime" for wireless broadband applications, and many companies have begun to announce wireless business plans for future Internet access service.[5] A number of wireless technologies, corresponding to different parts of the electromagnetic spectrum, have potential. These include the upperbands (above 24GHz), the lowerbands (multipoint distribution service or

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[4] Channels 60-69 are being made available as broadcasters migrate to digital television. For more information see: *Digital Television: Recent Developments and Congressional Issues*, CRS Report 97-925 STM, by Richard Nunno.

[5] Kaut, David, "FCC Officials See Wireless Progress Around Corner, Key to Broadband Market," *BNA Daily Report for Executives*, December 13, 1999.

MDS, below 3 GHz), broadband personal communications services (PCS), wireless communications service (2.3 GHz), and unlicenced spectrum.

Another broadband technology is optical fiber to the home (FTTH). Optical fiber cable, already used by businesses as high speed links for long distance voice and data traffic, has tremendous data capacity, with rates in excess of one gigabit per second (1000 Mbps). The high cost of installing optical fiber in users' homes is the major barrier to FTTH. Several telephone companies are exploring ways to provide FTTH at a reasonable cost. Some public utilities are also exploring or beginning to offer broadband access via fiber inside their existing conduits. Additionally, some companies are investigating the feasibility of transmitting data over power lines, which are already ubiquitous in people's homes. While enormous data rates are possible through power lines, significant technical barriers remain.

Status of Broadband Deployment

Broadband technologies are currently being deployed by the private sector throughout the United States. According to a survey conducted by the Federal Communications Commission (FCC), as of June 30, 2000 there were 2.8 million broadband lines in the United States.[6] The table (below) shows a breakdown by types of broadband technology. Additionally, if one includes one-way high speed Internet lines, the number rises to 4.3 million, an increase of 57% over December 1999.

Table – Number of Advanced Services (Broadband) Lines

(over 200 Kbps in both directions)

Technology	Dec. 1999	June 2000	% Change
ADSL	185,950	325,901	+75
Other Wireline*	609,909	747,028	+22
Coaxial Cable	879,671	1,434,237	+63
Fiber	307,315	301,551	n.m.**
Satellite & Fixed Wireless	7,816	3,649	n.m.**
Total lines	1,990,662	2,812,366	+41

* Includes symmetric DSL and traditional telephone company high speed lines such as T1 and T3 lines.

** Not meaningful due to previously unidentified inconsistencies in reported data.

Source: FCC

According to a sampling survey conducted by the Department of Commerce, as of August 2000, 10.7% of online households (about 4.5% of all U.S. households) had broadband access.[7] More specific and recent data are available from research and consulting firms which track broadband deployment in the telephone and cable industries. According to Kinetic Strategies Inc., an estimated 5.5 million households in North America subscribed to cable modem services (as of March 1, 2001), with service available to an estimated 64 million households. Kinetic Strategies projects 20 million installed cable modem customers in North America by the end of 2004. Meanwhile, according to TeleChoice Inc., 2.4 million DSL lines were in service in the United States by the end of December 2000. TeleChoice

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[6] Federal Communications Commission, *High-Speed Services for Internet Access: Subscribership as of June 30, 2000*, October 2000, see:
[http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/hspd1000.pdf]

[7] *Falling Through the Net: Toward Digital Inclusion*, p. 23.

estimates that the number of U.S. DSL lines in service will grow to 5.7 million by the end of 2001, with further growth to 17.4 million DSL lines by the end of 2004.

Policy Issues

The deployment of broadband to the American home is being financed and implemented by the private sector. The future of broadband is full of uncertainty, as competing companies and industries try to anticipate technological advances, market conditions, consumer preferences, and even cultural and societal trends. What seems clear is that industry believes that providing broadband services to the home offers the potential of financial return worthy of significant investment and some level of risk.

From a public policy perspective, the goals are to ensure that broadband deployment is timely, that industry competes fairly, and that service is available to all sectors and geographical locations of American society. Section 706 of the Telecommunications Act of 1996 (P.L. 104-104) requires the FCC to determine whether "advanced telecommunications capability [i.e., broadband or high-speed access] is being deployed to all Americans in a reasonable and timely fashion." If this is not the case, the Act directs the FCC to "take immediate action to accelerate deployment of such capability by removing barriers to infrastructure investment and by promoting competition in the telecommunications market."

On January 28, 1999, the FCC adopted a report (FCC 99-5) pursuant to Section 706. The report concluded that "the consumer broadband market is in the early stages of development, and that, while it is too early to reach definitive conclusions, aggregate data suggests that broadband is being deployed in a reasonable and timely fashion."[8] The FCC announced that it would continue to monitor closely the deployment of broadband capability in annual reports and that, where necessary, it would "not hesitate to reduce barriers to competition and infrastructure investment to ensure that market conditions are conducive to investment, innovation, and meeting the needs of all consumers." The Commission's second Section 706 report (FCC 00-290) was released on August 21, 2000. Based on data collected from telecommunications service providers, an ongoing Federal-State Joint Conference to promote advanced broadband services, and the public, the report concluded that advanced telecommunications capability is being deployed in a reasonable and timely fashion overall, although certain groups of consumers were identified as being particularly vulnerable to not receiving service in a timely fashion. Those groups include rural, minority, low-income, and inner city consumers, as well as tribal areas and consumers in U.S. territories. The FCC acknowledges that more sophisticated data are still needed in order to portray a thoroughly accurate picture of broadband deployment.

While the FCC's position is not to intervene at this time, some assert that legislation is necessary to ensure fair competition and timely broadband deployment. Currently, the debate centers on two specific proposals. Those are: 1) easing certain legal restrictions and requirements, imposed by the Telecommunications Act of 1996, on incumbent telephone companies that provide high-speed data (broadband) access, and 2)compelling cable companies to provide "open access" to competing Internet service providers. Each course

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[8] FCC News Release, "FCC Issues Report on the Deployment of Advanced Telecommunications Capability to All Americans," January 28, 1999.

of action is strongly advocated or opposed by competing telecommunications and/or Internet-related interests.

Easing Restrictions and Requirements on Incumbent Telephone Companies. The debate over access to broadband services has prompted policymakers to examine a range of issues to ensure that broadband will be available on a timely and equal basis to all U.S. citizens. One issue under examination is whether present laws and subsequent regulatory policies as they are applied to the ILECs (incumbent local exchange [telephone] companies such as SBC or Verizon (formerly known as Bell Atlantic)) are thwarting the deployment of such services. Two such regulations are the restrictions placed on Bell operating company provision of long distance services within their service territories, and network unbundling and resale requirements imposed on all incumbent telephone companies. In the 107th Congress, H.R. 1542 would lift these restrictions and requirements for high speed data (broadband) transmission. Whether such requirements are necessary to ensure the development of competition and its subsequent consumer benefits, or are overly burdensome and only discourage needed investment in and deployment of broadband services, continues to be debated.

Provision of InterLATA Services. As a result of the 1984 AT&T divestiture, the Bell System service territory was broken up into service regions and assigned to regional Bell operating companies (BOCs). The geographic area in which a BOC may provide telephone services within its region was further divided into local access and transport areas, or LATAs. These LATAs total 164 and vary dramatically in size. LATAs generally contain one major metropolitan area and a BOC will have numerous LATAs within its designated service region.

Telephone traffic that crosses LATA boundaries is referred to as interLATA traffic. Restrictions contained in Section 271 of the Telecommunications Act of 1996 prohibit the BOCs from offering interLATA services within their service regions until certain conditions are met. BOCs seeking to provide such services must file an application with the FCC and the appropriate state regulatory authority that demonstrates compliance with a 14-point competitive checklist of market-opening requirements. The FCC, after consultation with the Justice Department and the relevant state regulatory commission, determines whether the BOC is in compliance and can be authorized to provide in-region interLATA services. To date two BOCs, Verizon and SBC Communications have received approval to enter the in-region interLATA market in specific markets. Verizon has received approval to offer in-region long distance service to its New York state and Massachusetts customers. SBC Communications has received approval to offer in-region interLATA services in Texas, Kansas, and Oklahoma. The independent telephone companies, or non-BOC providers of local service, are not subject to these restrictions and may carry telephone traffic regardless of whether it crosses LATA boundaries.[9]

However, the FCC has established a procedure whereby a BOC can request a limited modification of a LATA boundary to provide broadband services, particularly in unserved or underserved areas. In a February 2000 decision, the FCC concluded that it had the authority

[9] For a more complete discussion of LATAs and BOC entry into the long distance market see CRS Report RL30018, *Long Distance Telephony: Bell Operating Company Entry Into the Long-Distance Market*, by James R. Riehl.

"to approve targeted LATA boundary modifications when necessary to encourage the deployment of advanced services." The FCC established a two prong test when considering such requests. The Commission further stated that "particular attention" would be paid to the views of the state commission on whether the modification would serve the public interest and that such modifications would be "narrowly tailored."

Unbundling and Resale. Present law requires all ILECs to open up their networks to enable competitors to lease out parts of the incumbent's network. These unbundling and resale requirements, which are detailed in Section 251 of the Telecommunications Act of 1996, were enacted in an attempt to open up the local telephone network to competitors. Under these provisions ILECS are required to grant competitors access to individual pieces, or elements, of their networks (e.g., a line or a switch) and to sell them at below retail prices.

Proponents Views. Those supporting the lifting or modification of restrictions claim that action is needed to promote the deployment of broadband services, particularly in rural and under served areas. Present regulations contained in Sections 271 and 251 of the 1996 Telecommunications Act, they claim, are overly burdensome and discourage needed investment in broadband services. According to proponents, unbundling and resale requirements, when applied to advanced services, provide a disincentive for ILECs to upgrade their networks, while BOC interLATA data restrictions unnecessarily restrict the development of the broadband network. ILECs, they state, are the only entities likely to provide these services in low volume rural and other under served areas. Therefore, proponents claim, until these regulations are removed the development and the pace of deployment of broadband technology and services, particularly in unserved areas, will be lacking. Furthermore, supporters state, domination of the Internet backbone[10] market is emerging as a concern and entrance by ILECs (particularly the BOCs) into this market will ensure that competition will thrive with no single or small group of providers dominating. Proponents also cite the need for regulatory parity; cable companies who serve approximately 75 percent of the broadband market are not subject to these requirements. Additional concerns that the lifting of restrictions on data would remove BOC incentives to open up the local loop to gain interLATA relief for voice services are also unfounded, they state. The demand by consumers for bundled services and the large and lucrative nature of the long distance voice market will, according to proponents, provide the necessary incentives for BOCs to seek relief for interLATA voice services.

Opponents Views. Opponents claim that the lifting of restrictions and requirements will undermine the incentives needed to ensure that the BOCs and the other ILECs will open up their networks to competition. Present restrictions, opponents claim, were built into the 1996 Telecommunications Act to help ensure that competition will develop in the provision of telecommunications services. Modification of these regulations, critics claim, will remove the incentives needed to open up the "monopoly" in the provision of local services. Competitive safeguards such as unbundling and resale are necessary, opponents claim, to ensure that competitors will have access to the "monopoly bottleneck" last mile to the customer. Therefore, they state the enactment of legislation to modify these provisions of the 1996 Telecommunications Act will all but stop the growth of competition in the provision of

[10] An Internet backbone is a very high-speed, high-capacity data conduit that local or regional networks connect to for long-distance interconnection.

local telephone service. A major change in existing regulations, opponents claim, would not only remove the incentives needed to open up the local loop but would likely result in the financial ruin of providers attempting to offer competition to incumbent local exchange carriers. As a result, consumers will be hurt, critics claim, since the hoped-for benefits of competition such as increased consumer choice and lower rates will never emerge. Concern over the inability of regulators to distinguish between provision of voice only and data services if BOC interLATA restrictions for data services and ILEC unbundling and resale requirements for advanced services are lifted was also expressed. Opponents also dismiss arguments that BOC entrance into the marketplace is needed to ensure competition. The marketplace, opponents claim, is a dynamic and growing one and alleged concerns over the lack of competition or market dominance are misplaced.

Open Access. Legislation introduced into the 106th Congress sought to prohibit anticompetitive contracts and anticompetitive or discriminatory behavior by broadband access transport providers. The legislation would have had the effect of requiring cable companies who provide broadband access to give "open access" (also referred to as "forced access" by its opponents) to all Internet service providers. Currently, customers using cable broadband must sign up with an ISP affiliated or owned by their cable company. If customers want to access another ISP, they must pay extra — one monthly fee to the cable company's service (which includes the cable ISP) and another to their ISP of choice. In effect, the legislation would enable cable broadband customers to subscribe to their ISP of choice without first going through their cable provider's ISP. At issue is whether cable networks should be required to share their lines with, and give equal treatment to, rival ISPs who wish to sell their services to consumers.

Arguments in favor. Internet service providers not affiliated (or "bundled") with a cable service are perhaps the principal supporters of open access provisions. Their support of open access is driven by the concern that they could lose significant market share if cable broadband access becomes widely adopted in American homes. Some Internet content providers, long-distance providers, regional phone companies, and consumer groups have also expressed support for open access.[11] They argue that without open access, competition will be stifled and cable companies will be in a position to eventually monopolize and control broadband access to the Internet. Currently, competition is flourishing among an estimated 6,000 ISPs in the United States, with the result of falling prices and rising quality and diversity of services for consumers. Without this competition in cable broadband services, say proponents of open access, the vibrancy, dynamism, and growth of the Internet may suffer.

Open access proponents further point out that a closed cable network discriminates in service quality between the cable-owned Internet service providers, whose content is directly accessible, and independent Internet service providers, whose content is only indirectly available through the Internet. They also argue that content may be restricted by cable providers, and point to some cable companies' stated intention to restrict consumer access to any video material on the Internet longer than 10 minutes (presumably, say open access

[11] For a listing of open access supporters, see web site of OpenNet Coalition: [http://www.opennetcoalition.org]

advocates, to prevent Internet delivered video from competing with cable television video programming).

Finally, an argument of fairness and "maintaining a level playing field" in broadband is often advanced by open access proponents. Given that telephone companies providing Internet access are required to allow open and equitable access to all ISPs, why, they argue, should not the cable industry — which competes with telephone companies for Internet customers — be subject to the same requirements?

Arguments against. The cable industry strongly opposes open access provisions, arguing that the legislation would impose unnecessary government regulation on their activities. AT&T, Time Warner Cable, and Cox Communications all testified against open access at congressional hearings in the 106th Congress. Cable providers argue that an open access mandate would inhibit their ongoing nationwide investment in broadband access. Government regulation, they argue, would create uncertainty in the market and make it more difficult to justify the huge capital investments that are necessary. Given that the goal of public policymakers is the timely availability of affordable broadband service to as many Americans as possible, an open access mandate, they assert, would slow the industry's progress toward achieving this goal.

Additionally, the cable industry representatives reject the argument that without open access, competition in the Internet access market will be stifled. They maintain that vigorous competition already exists with competing broadband access technologies (i.e., DSL, satellite). They point out that it is likely that market forces will eventually dictate that cable companies open their platform to competing ISPs without the need for government regulation. With broadband deployment currently at a nascent and highly dynamic stage, they argue, it is not possible for government policymakers or regulators to predict future market or technological trends with any degree of certainty. Therefore, they assert, any kind of government intervention into the marketplace would be premature and ill-advised.

The cable companies also dispute the notion that they are creating a "closed network," and point out that cable modem users are free to access any content available on the Internet. In response to criticism regarding the 10-minute limit on video, cable spokespersons state that the costs of allowing unlimited video downloads are prohibitive at present. However, they assert, since cable Internet access will be subject to a competitive marketplace, worries about the effects of restrictive cable practices are unfounded because market forces will ultimately ensure that consumers will receive the services and content that they demand.

Finally, the cable companies advance their own argument of fairness. The cable industry has invested enormous amounts of money to build a cable broadband system (estimates range over $30 billion). A government requirement to modify their equipment to allow open access to possibly hundreds of ISPs would be technically difficult and expensive, they say. Why, they ask, should unaffiliated ISPs reap the benefits of cable industry investments?

Local debate moves to federal level. The arguments for and against open access have been heard on the local level, as cities, counties, and states have taken up the issue of whether to mandate open access requirements on local cable franchises. In June 1999, a federal judge ruled that the city of Portland, OR, had the right to require open access to the Tele-Communications Incorporated (TCI) broadband network as a condition for transferring

its local cable television franchise to AT&T. AT&T appealed the ruling to the U.S. Court of Appeals for the Ninth Circuit. On June 22, 2000, the Court ruled in favor of AT&T, thereby reversing the earlier ruling. The court ruled that high-speed Internet access via a cable modem is defined as a "telecommunications service," and not subject to direct regulation by local franchising authorities.

The debate thus moves to the federal level, where many interpret the Court's decision as giving the FCC authority to regulate broadband cable services as a "telecommunications service." However, the FCC also has the authority *not* to regulate if it determines that such action is unnecessary to prevent discrimination and protect consumers. To date, the FCC has chosen *not* to mandate open access, citing the infancy of cable broadband service and the current and future availability of competitive technologies such as DSL and satellite broadband services. However, in light of the June 22 court decision, the FCC announced, on June 30, 2000, that it will conduct a formal proceeding to determine whether or not cable-Internet service should be regulated as a telecommunications service, and whether the FCC should mandate open access nationwide. On September 28, 2000, the FCC formally issued a Notice of Inquiry (NOI) which will explore whether or not the Commission should require access to cable and other high- speed systems by Internet Service Providers (ISPs).[12]

Cable Industry Developments. Recent developments within the cable industry could have an impact on the open access debate. On December 6, 1999, AT&T (the nation's largest cable company after its purchase of TCI and merger with MediaOne) announced an agreement to provide Mindspring (now EarthLink, the nation's second largest ISP) access to its broadband cable system starting in mid-2002 (i.e. when AT&T's contract with its affiliated ISP, Excite@Home, expires). AT&T has pointed to the agreement with EarthLink as evidence that access issues should be left to market forces and need not be mandated by government regulation. In November 2000, AT&T Broadband began a series of field trials which would allow multiple ISPs, for a monthly fee, to access its cable platform. If technically feasible, AT&T Broadband's proposal is to allow access for any ISP that passes reliability tests.

On January 10, 2000, AOL announced plans to merge with Time Warner, Inc. The merger gives AOL access to the second largest cable television system in the U.S., and a share in Roadrunner, one of the two major cable modem ISPs. Since the merger announcement, AOL has said it intends to open Time Warner's broadband cable platform to other ISPs. While supporting the principle of open access, AOL has stated that it prefers market solutions to a government mandate for open access. Many supporters of open access have asserted that AOL's post-merger position, favoring market over government solutions, will ultimately leave many of the nation's 6000 ISPs without broadband access. On February 29, 2000, AOL and Time Warner took a further step toward open access by signing a memorandum of understanding (MOU) that commits the company to provide access to as many ISPs as is technically possible. The MOU pledges no restrictions on video streaming, no discrimination based on affiliation, and no restrictions on ISP direct billing and collections. On November 20, 2000, Time Warner announced an agreement to provide EarthLink access to its high-speed cable system. On December 14, 2000, the Federal Trade Commission (FTC) announced its approval of the AOL-Time Warner merger with conditions. Under the terms

[12] See: [http://www.fcc.gov/Bureaus/Miscellaneous/Notices/2000/fcc00355.pdf]

of the proposed consent order, AOL Time Warner is required to open its cable systems to competing ISPs, and prohibited from interfering with the content passed along the bandwidth contracted for by non-affiliated ISPs. Specifically, AOL Time Warner is required to make available to subscribers at least one non-affiliated cable broadband ISP service before AOL itself began offering service, followed by two other non-affiliated ISPs within 90 days (and a requirement to negotiate in good faith with others after that). Finally, on January 11, 2001, the FCC announced its approval of the merger, with additional conditions that: prevent AOL Time Warner from interfering in customer choice of ISPs; require AOL Time Warner to allow competing ISPs to control the first screen that their customers call up; and require AOL Time Warner to give unaffiliated ISPs the same quality of service guaranteed to affiliated ISPs.

In light of industry pledges to provide open access – as well as the open access conditions imposed on AOL Time Warner by the FTC and the FCC – some view open access legislation as unnecessary. On the other hand, proponents argue that open access will not be achieved as quickly, equitably, or uniformly without a legislative mandate.

Activities in the 106th and 107th Congress

In the 106th Congress, legislation was introduced that sought to require cable companies to open their high-speed networks to competing Internet service providers. H.R. 1685 and H.R. 1686 would have prohibited "anticompetitive or discriminatory behavior" by broadband access transport providers that have "market power," and would deem as a violation of antitrust law any preferential treatment given to affiliated ISPs. The legislation would have had the effect of compelling cable companies that provide broadband access to give "open access" to all Internet service providers.

Other legislative provisions in the 106th Congress sought to accelerate the deployment of broadband services by easing regulatory restrictions on ILECs. Included among the proposed legislative remedies were allowing Bell operating companies to offer data services across LATA boundaries, and easing requirements on ILECs to share (via unbundling and resale) their high speed networks with competing companies. Hearings on broadband access were held by a number of congressional committees, including House Commerce, House Judiciary, Senate Commerce, and Senate Judiciary. None of those bills were enacted by the 106th Congress.

In the 107th Congress, H.R. 1542 (Tauzin-Dingell) was introduced on April 24, 2001. Similar to legislation considered in the 106th Congress (H.R. 2420), the bill would lift or ease regulatory restrictions on ILECs and Bell operating companies. The intent of the bill is to encourage the deployment of broadband services to rural and underserved areas by easing interLATA (local access and transport area) service restrictions imposed on the Bell operating companies (BOCs) and loosening unbundling and resale obligations imposed on ILECs.

H.R.1542 amends provisions contained in Sections 271 (BOC entry into interLATA services) and 251(interconnection) of the 1996 Telecommunications Act (PL 104-104). Under present law, Section 271 prohibits the BOCs from offering interLATA services within their service regions until certain conditions are met. H.R. 1542 lifts these restrictions for the provision of data traffic; restrictions on voice traffic remain. The bill permits a BOC to

offer high speed data service[13] and Internet access service[14] across LATAs within its service territory without having to meet Section 271 requirements.

H.R. 1542 also amends Section 251 of the 1996 Act by exempting high speed data services from unbundling requirements and resale obligations. The bill prohibits the Federal Communications Commission (FCC) from requiring an ILEC to "provide unbundled access to any network elements used in the provision of any high speed data service."[15] In addition, ILECs are not required to offer high speed data services for resale at wholesale rates.

H.R. 1542 also contains provisions to provide Internet users with access to the Internet service provider (ISP) of their choice. Section 5 requires ILECs to: provide Internet users with the ability to subscribe to and have access to any ISP that is interconnected to the carrier's high speed data service; permit ISPs to acquire the facilities and services necessary to interconnect with the carrier's high speed data service for the provision of Internet access service; and permit equipment collocation to the extent necessary for the provision of Internet access service. Section 4 contains provisions to limit the regulation of high speed data services. With noted exceptions detailed in the savings provision or expressly referred to in the legislation neither the FCC, nor any state, "shall have the authority to regulate the rates, charges, terms, or conditions for, or entry into the provision of, any high speed data service or Internet access service, or to regulate the facilities in the provision of such service."

On April 25, 2001 the House Energy and Commerce Committee held a hearing on H.R. 1542. The Subcommittee on Telecommunications and the Internet held a markup on April 26 and passed the measure, as amended, by a vote of 19-14. Adopted amendments would: clarify that the BOC's may not bundle or offer long distance voice services with high-speed data offerings, even if the voice services were offered at no charge; increase fines for violations of any enforcement measures contained in the bill to a maximum of $1 million per violation per day capped at $10 million for any single act; prohibit subsidies on high-speed data services ensuring parity with non-local exchange companies regarding subsidies;[16] and prevent the FCC from imposing fees, taxes, charges, or tariffs on Internet services.

Other legislation introduced into the 107th Congress would provide tax credits (S. 88, S. 150, S. 426, and H.R. 267) and grant/loan guarantees (S. 428 and H.R. 1416) for broadband deployment primarily in rural and/or low income areas. For more information on federal assistance for broadband deployment, please see CRS Report RL30719, *Broadband and the Digital Divide: Federal Assistance Programs*.

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[13] H.R. 1542 defines high speed data services as "information at a rate that is generally not less than 384 kilobits per second in at least one direction."

[14] Internet access service does not include the portion of such transmission from the user to the provider of such service.

[15] An exception is made for network elements described in 47 C.F.R. 51.319, as in effect on January 1, 1999.

[16] It appears that further clarification may be needed regarding the specific intent of this amendment entitled "Prohibition Discriminatory Subsidies".

Selected 106th Congress Legislation

H.R. 1685 (Boucher)

Internet Growth and Development Act of 1999. Prohibits anticompetitive or discriminatory behavior by broadband access transport providers that have market power, and would deem as a violation of antitrust law any preferential treatment given to affiliated ISPs. Amends the Communications Act of 1934 to lift restrictions on interLATA data transmission by incumbent telephone companies and to remove, under certain conditions, unbundling and resale requirements. Introduced May 5, 1999; referred to Committees on Commerce and on the Judiciary. Referred May 25, 1999, to Subcommittee on Telecommunications, Trade, and Consumer Protection. Committee on the Judiciary held hearings June 30, 1999 and July 18, 2000.

H.R. 1686 (Goodlatte)

Internet Freedom Act. Prohibits anticompetitive or discriminatory behavior by broadband access transport providers that have market power, and would deem as a violation of antitrust law any preferential treatment given to affiliated ISPs. Amends the Communications Act of 1934 to lift restrictions on interLATA data transmission by incumbent telephone companies and to remove, under certain conditions, unbundling and resale requirements. Introduced May 5, 1999; referred to Committees on the Judiciary and on Commerce. Referred May 25, 1999, to Subcommittee on Telecommunications, Trade, and Consumer Protection. Committee on the Judiciary held hearings June 30, 1999 and July 18, 2000.

H.R. 2420 (Tauzin)

Internet Freedom and Broadband Deployment Act of 1999. Amends the Communications Act of 1934 to prohibit any states or the FCC from regulating the provision of high speed data services. Lifts restrictions on interLATA data transmission by Bell operating companies while also removing unbundling and resale requirements for all incumbent telephone companies in the provision of high speed data services. Requires incumbent local exchange companies to provide any Internet Service Provider with the right to interconnect with such carrier's high speed data service. Introduced July 1, 1999; referred to Committee on Commerce. Hearing held July 27, 2000.

S. 1043 (McCain)

Internet Regulatory Freedom Act of 1999. Amends the Communications Act of 1934 to limit FCC authority to impose restrictions on the provision of Internet services, including data transmission. Introduced May 13, 1999; referred to Committee on Commerce, Science, and Transportation.

S. 2902 (Brownback)

Broadband Internet Regulatory Relief Act of 2000. Amends the Communications Act of 1934 to ease restrictions on the provision of high-speed data services by incumbent local exchange companies. Introduced July 20, 2000; referred to Committee on Commerce, Science, and Transportation.

LEGISLATION

H.R. 267 (English)

Broadband Internet Access Act of 2001. Provides tax credits for five years to companies investing in broadband equipment to serve rural and low-income areas. Provides a 10% tax credit for "current generation" broadband service (defined as download speeds of at least 1.5 million bits per second), and a 20% tax credit for "next generation" broadband service (defined as download speeds of at least 22 million bits per second). Introduced January 30, 2001; referred to Committee on Ways and Means.

H.R. 1416 (LaFalce)

Broadband Expansion Grant Initiative of 2001. Authorizes $100 million in grants and loan guarantees from the Department of Commerce for deployment by the private sector of broadband telecommunications networks and capabilities to underserved rural areas. Introduced April 4, 2001; referred to Committee on Energy and Commerce.

H.R. 1542 (Tauzin)

Internet Freedom and Broadband Deployment Act of 2001. Amends the Communications Act of 1934 to prohibit any states or the FCC from regulating the provision of high speed data services. Lifts restrictions on interLATA data transmission by Bell operating companies while also removing unbundling and resale requirements for all incumbent telephone companies in the provision of high speed data services. Requires incumbent local exchange companies to provide any Internet Service Provider with the right to interconnect with such carrier's high speed data service. Introduced April 24, 2001; referred to Committee on Commerce. Hearing held April 25; markup held by Subcommittee on Telecommunications and the Internet on April 26; passed subcommittee, as amended, 19-14.

S. 88 (Rockefeller)

Broadband Internet Access Act of 2001. Provides tax credits for five years to companies investing in broadband equipment to serve rural and low-income areas. Provides a 10% tax credit for "current generation" broadband service (defined as download speeds of at least 1.5 million bits per second), and a 20% tax credit for "next generation" broadband service (defined as download speeds of at least 22 million bits per second). Introduced January 22, 2001; referred to Committee on Finance.

S. 150 (Kerry)

Broadband Deployment Act of 2001. Provides tax credits for five years to companies investing in broadband equipment to serve low-income areas. Provides a 10% tax credit for broadband service delivering a minimum download speed of 1.5 million bits per second. Introduced January 23, 2001; referred to Committee on Finance.

S. 426 (Clinton)

Technology Bond Initiative of 2001. Provides an income tax credit to holders of bonds financing the deployment of broadband technologies. Introduced March 1, 2001; referred to Committee on Finance.

S. 428 (Clinton)

Broadband Expansion Grant Initiative of 2001. Authorizes $100 million in grants and loan guarantees from the Department of Commerce for deployment by the private sector of broadband telecommunications networks and capabilities to underserved rural areas. Introduced March 1, 2001; referred to Committee on Commerce, Science, and Transportation.

S. 430 (Clinton)

Broadband Rural Research Investment Act of 2001. Authorizes $25 million for the National Science Foundation to fund research on broadband services in rural and other remote areas. Introduced March 1, 2001; referred to Committee on Finance.

FOR ADDITIONAL READING

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FCC, Deployment of Advanced Telecommunications Capability: Second Report, August 2000, (CC Docket No. 98-146, FCC 00-290). [http://www.fcc.gov/Bureaus/Common_Carrier/Orders/2000/fcc00290.pdf]

FCC Resource Guide: Broadband Internet Access [http://www.fcc.gov/broadband/]

General Accounting Office, *Technological and Regulatory Factors Affecting Consumer Choice of Internet Providers*, GAO-01-93, October 2000, 68 p.

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"Special Report: High-Speed Data Races Home," *Scientific American*, October 1999, pp. 94-115.